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SCIENCE

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THE UNIVERSITY DEPARTMENT OF MEDICINE

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THAT all is not well with medical education is obvious from the number of investigations, addresses, polemics, plans and schemes which at present center about this subject. In the writer's opinion the root of the difficulty lies in the extremely close association which has always existed and exists to-day between medical education and practise, and in the idea which generally prevails that the problems relating to medical education and those having to do with the practise of medicine are inseparable. While many persons admit for purposes of discussion that a line of separation exists between the science of medicine and the art of the practise of medicine, yet when these individuals begin to think in practical terms, they fail to take this fact into consideration. Indeed, in their inmost souls, most medical men refuse to admit that medicine is a science, or they think of the scientific side of the subject as something apart from medicine itself, as though scientific medicine were simply the group of underlying sciences upon which medicine depends for sustenance. Even Sir Clifford Allbutt, in his remarkable essay on the "New Birth of Medicine," speaks of the new birth as an "enlargement from an art of observation and empiricism to an *applied* science . . ., from a craft of tradition and sagacity to an *applied* science." Why is it that we can conceive of medicine only as an application of science to an "art" or "craft," and not as a new, real and independent science replacing an obsolete mass of tradition and empiricism?

It is true that the science of medicine is in the process of making—but so is every other science. There is no such thing as a rounded, completed or finished science. At any given time any science is but the result of all previous attempts to arrange in order and to explain

the facts and phenomena relating to some field of knowledge which is more or less definitely outlined, and which is large enough and important enough to deserve such treatment. As new facts are constantly being discovered in all realms of knowledge, all sciences are in a constant state of development.

The abnormalities and functional disturbances of man surely constitute a large and important field of human interest. Marked advances in knowledge concerning the phenomena and nature of disease have already been made, especially in recent years, and this knowledge is constantly being arranged, and the phenomena are being studied in their relation to each other and to other phenomena. Medicine, then, is developing just as other sciences have done and are doing; its subject-matter is receiving the same kind of treatment that is succeeding in other domains of human knowledge. Therefore, on account of the importance of the subject, and because of the advances which have already occurred in our knowledge concerning disease and the progress which has been made in the scientific treatment of this knowledge, medicine deserves to rank as an independent science.

If physiology may be an independent science, if anatomy may be an independent science, why not medicine? Why should medicine be only an *applied* science, any more than anatomy or physiology? Anatomical and physiological knowledge may be applied to practical affairs as well as medical knowledge. Why should medicine be inseparably associated with the doctor's consulting room any more than anatomy with the surgeon's operating room or the artist's studio?

Since definition is more important than argument, let us consider what we mean by medicine, or better, the science of medicine. First, let us consider what it is not. It is not anatomy, it is not physiology, for these sciences deal with the normal or healthy; it is not pharmacology, strictly speaking, for as this science has so far developed, it has dealt with the nature of drugs and their action on normal animals. These sciences, however, together with such fundamental sciences as chemistry

and physics, are frequently spoken of as the medical sciences, the institutes of medicine, or indeed collectively as the science of medicine.

To define exactly what medicine is is not easy. Medicine deals with disease, the antithesis of health; it deals with the abnormal, the departure from the average. When we come to consider whether medicine includes all aspects of disease, or only certain ones, we meet with difficulties. The accepted use of the term does not aid us, for there is no universally accepted use, even among the most strict and thoughtful men. The dictionaries define medicine as the science and art dealing with the *prevention, cure* or *alleviation* of disease. Pathology, on the other hand, is defined as the science treating of the *nature, causes, progress, manifestations* and *results* of disease. According to the definitions, therefore, pathology has to do with the nature of disease, medicine with the application of that knowledge. That these definitions are purely academic, however, and not real, is made evident by referring to the text-books dealing with these subjects, for we must consider that the text-books of the day present not only the accumulated knowledge concerning the subjects treated, but also the contemporary conception of the boundaries of these subjects.

If we refer to any text-book on medicine, whether it be labelled practical medicine, the practise of medicine, or merely medicine, and look up any disease, it will be found that nine tenths of the subject-matter deals with the "nature, causes, progress, manifestations and results" of the disease, under the headings etiology, symptomatology, complications, prognosis and so forth, and only one tenth deals with prevention and cure. On the other hand, most text-books of pathology do not treat of the "nature, causes, progress and manifestations" of disease at all; they consider only the morphologic changes resulting from disease. It is evident, therefore, that the definitions of pathology and medicine quoted above are obsolete, even though practitioners of medicine may not take cognizance of the fact. In my opinion, the old implied distinction between pathology and medicine has had a blighting

effect upon the development of medicine as a science. Twenty-five years ago, however, it became dimly recognized that this distinction between medicine and pathology is not a real one, at least that pathological anatomy is an essential part of the science of medicine. The improvement in the teaching of medicine which occurred at that time and the resulting increase in medical knowledge may be directly traced to this new conception.

It is of importance that medicine should now be generally recognized as an independent science, just as physiology and anatomy are independent sciences. *Medicine may then be defined as the science dealing with the phenomena of disease.*

Let us grant now that there is or may be a science dealing with disease. How can this science best be fostered and how can this new science be most effectively utilized? As our medical schools are now organized, they are composed, on the one hand, of a group of departments devoted to the teaching and development of the so-called contributing sciences, anatomy, physiology and pharmacology; and on the other hand, of a large group of distinct departments, the chief function of which is to train men for the practise of medicine. As I have previously stated, however, anatomy, physiology and pharmacology have only the same relation to medicine that chemistry and physics have to anatomy and physiology. That the departments of anatomy, physiology and pharmacology are not independent university departments, but are included in the medical school, is in my opinion only accidental and is not an essential condition for the development either of these sciences or of medicine. The inclusion of these departments in the medical school has occurred chiefly because almost all the students working in them expect later to study medicine. Not so many years ago, however, practically all students of chemistry likewise expected to study medicine, and in many colleges the department of chemistry was also included in the medical school. To-day only a relatively small number of the students of chemistry look forward to the study of medicine, and in consequence, the department of

chemistry constitutes a part of the medical school in only a very few universities.

The present organization of the medical school, therefore, has been largely influenced by expediency and by the effort to obtain economy in administration. With a satisfactory university administration, the department of medicine (and under this term I include all the departments of the medical school that are engaged in the study of disease) might perfectly well constitute the whole medical school, probably with considerable advantage to the departments of anatomy and physiology. With the present laws governing medical practise, however, it is necessary that the grouping of various departments into medical schools be continued. There is no serious disadvantage in this so long as there is a full realization of the reasons for this grouping, and so long as the relation of the various departments to each other and to the university, and especially the relation of the department of medicine to the university, is kept clearly in mind.

During the past fifty years a marked improvement has taken place in the departments which are concerned with the so-called contributing sciences. In many schools these departments now rank among the strongest university departments, both in the quality of the instruction and in the contributions which they make to the advancement of knowledge. One of the most important of the factors which have contributed to this improvement has been the release of these departments from the restrictions imposed upon them by those engaged in the practise of medicine. No longer are the teachers themselves practitioners of medicine, no longer is the efficiency of the department judged entirely by the contributions made to the immediate demands of practise. That is, they have become true university departments.

The department concerned with medicine, however, has not developed in the same way. There the demands of practise and the needs of practitioners are still the controlling factors in organization and development. As one result of this there has been developed within the department of medicine numerous branches hav-

ing little coherence and no general guiding principle of organization or function. In many schools some of these branches have become much more important than the parent stem, both as regards resources and as regards the character of the work which is undertaken. There are departments of surgery, of orthopedics, of psychiatry, of genito-urinary diseases, of gastro-intestinal diseases, of pediatrics, of ophthalmology, of dermatology, of laryngology, of endocrinology, of electrotherapeutics, and so forth, and so on. Some of these departments, owing to the skill and prominence of the professors in practise, have acquired buildings and equipment of greater extent than the educational importance of the subjects warrants, and of far greater extent than the scientific development of these subjects justifies.

It is true that one additional circumstance has contributed to this extensive partitioning of the department of medicine. Most universities and medical schools have been compelled to employ general hospitals for teaching purposes, hospitals which were primarily planned and organized to care for the sick poor. Now, within limits, the larger the general hospital, the more efficiently and economically it can be conducted, and in the medical and surgical treatment of large numbers of persons, a high degree of specialization has been found to be most effective. It does not follow, however, that the same principles which should apply to the organization of a general hospital should also apply to the organization of a clinic designed primarily for investigation and teaching, merely because both have one function in common, namely, the care and treatment of the sick. The university department of medicine has an added function, the investigation of disease and the teaching of students, and if a general hospital is to serve this added function, its organization must be modified accordingly.

In the efforts which have been made to improve the teaching of medicine, not infrequently that division of medicine having to do with the study of so-called internal diseases has received the least and last consideration. These diseases, however, because of the suffer-

ing and loss of life which result from them, are of far more practical importance than any other group of diseases. Of much more significance than this, at least from the educational standpoint, is the fact that the diseases of internal medicine are the ones which are most susceptible to scientific study, and thus far they are the principal diseases to which modern scientific methods of investigation have been applied. They are therefore the diseases with which the student of medicine should be chiefly concerned during his earlier years. It is in the study of these diseases that the student should develop his perspective and should obtain a knowledge of the methods which should be employed in the study of all other diseases. For this reason, in writing the following discussion of the department of medicine as a whole, I have had the division of internal medicine chiefly in mind, for this division should be a pattern for all the others.

Bearing in mind our definition of medicine and the conception of the boundaries of the department of medicine which we have adopted, let us consider what we mean by a university department of medicine. It is a department designed for the purpose of studying and investigating diseases, of accumulating and distributing the existing knowledge concerning disease and of contributing to the extension of this knowledge.

What is needed to create a university department? Exactly the same materials that are required in every other scientific department of the university—men, laboratories and books; and the most important of these is men. By men I mean students, of various grades. Some, the more advanced, we call teachers; the others, less developed, we call students; but they must *all* be constantly acquiring knowledge or the department is a failure. Moreover, the essential requirements for admission must be the same for teachers and students, though differing in degree. They must all have the desire for acquiring knowledge, they must have the desire to add to knowledge, and they must have the training and ability to enable them to carry out their desires. While all science is complex and all sciences are mu-

tually dependent, medicine seems the most complex of all. To know the abnormal we must have knowledge of the normal. That is, whatever is known of structure of the human body and the little that is known of function must be available. In other words, knowledge concerning anatomy and physiology must be in the possession of every student, and knowledge of these sciences requires knowledge of chemistry and physics. These are well-recognized facts that need not be dwelled upon further.

Are men available for such a department, as teachers and students, men who are interested in the study of disease and who desire to increase the knowledge concerning disease without any other material reward than the rewards of the student and scholar? Or has scholarship gone out of fashion? Or is this such an uninteresting subject that no men can be found to undertake its study? As long as men will study the stars with scientific methods, as long as men will study the stones with scientific methods, men will be found to study disease. The men are ready and waiting, the opportunity only is needed.

The second essential is laboratories. The astronomer must have his telescope through which to observe the stars; he must also have his chemical and his physical laboratories. The student of medicine must also have *his* observatory, the hospital, and in this he should also have laboratories—*his* laboratories—and not be a guest or intruder in laboratories belonging to other scientific workers—chemists, physiologists or others. It is just as impossible that the science of medicine can be studied at the bedside alone, where only superficial observation is possible, or that it can be studied only in the laboratory, where disease as it occurs in man is never present, as that astronomy can reach its highest development by observation through the telescope alone, or by spectroscopic and chemical studies alone. It is not uncommon that the contributing sciences in the medical school are spoken of as the *laboratory* branches and the medical divisions are spoken of as the *clinical* branches. This in my opinion reflects the mistaken opinion which prevails concerning the nature and

proper methods of the study of medicine. For the development and teaching of medicine, laboratories are as essential as they are for the study of physiology. But if they are to be used, they must be in close proximity to the wards, and they must be so arranged and organized that the work in the laboratories and in the wards can go on simultaneously and harmoniously in both. This conception of the hospital, however, is rare even among those who take the most advanced views concerning medical education. I know of one university hospital which is being planned before the professors or staff that are to work in it have been appointed. No architect or hospital superintendent can possibly accomplish this task. For instance, the superintendent of a general hospital must, of necessity, take an entirely different view of a hospital from the one which has been sketched. It would be just as sensible to have a foreman of a machine shop design a laboratory for the department of physics as to have a hospital superintendent design a university hospital. In each case the superintendent or foreman might be of great assistance and give useful suggestions, but he would be as incapable of conceiving the purpose, and therefore of working out the idea, in the one case as in the other.

It can not be denied that it will be expensive to install in each clinic of the hospital well-equipped laboratories in which the varieties of technique already developed in bacteriology, physiology and chemistry, can be used, and in which entirely new methods may be devised. This is essential, however, if the science of medicine is to develop. In a given clinic probably all the laboratories would not at any one time be of equal importance. In each clinic the development would probably be mainly along special lines. If the division of internal medicine, for instance, was a large one, there might be several clinics or units, in one of which the chief attention would be given to one variety of disease, in another, to another variety. In the study of human disease, however, much is gained in economy and effectiveness if studies take not only one, but several directions at the same time. The sub-

jects studied are so complex that it is wasteful to confine an investigation to a single narrow path. Thus in studying a group of patients suffering from an infectious disease, it is frequently important that they be studied not only from the standpoint of etiology, in which the chief work will be done in the bacteriological laboratory of the clinic, but it may be of great importance that, at the same time, alterations in metabolism and disturbances in function of the circulatory and respiratory systems be investigated, in which case the laboratory and technique of physiology or possibly of physics will be required, and on the same patients chemical studies of the blood or excretions may be valuable, all of which must be carried out in the special laboratories of the clinic. By carrying out all these procedures on the same patients, not only is expense saved, but each observation gains much in importance by being supplemented by the others.

In the university department of medicine there should not only be facilities for studying disease as it occurs in man, but there should also be facilities for carrying out experimental studies on animals. In many cases only by animal experimentation can the suggestions obtained from detailed observations on patients be confirmed or disproved.

With regard to the library, little need be said here except that it must be alive, not dead.

The above is my conception in brief of the essentials of a department of medicine in a university. Grant a central concept such as this on which to build, and it will not be difficult to elaborate the details, at least it will not be impossible. For instance, let us consider the number and kinds of the divisions into which any given department of medicine shall be divided, or in other words, the kinds of diseases for the study of which special clinics shall be provided. There can be little question that the diseases spoken of as surgical (because operative technique is employed in treating them) are of such great importance and the technique of their therapy has become so specialized, that one or more clinics of the department should be devoted to the study of these diseases. This does not mean, however,

that the methods employed in studying these diseases differ from those used in studying any other group of diseases. Exophthalmic goiter is the same disease whether we treat it by removal of the thyroid or by rest and drugs. Whether we call the professor who studies especially those diseases in which the chief therapeutic procedures are operative, a professor of surgery or a professor of medicine, is unimportant so far as the principle is concerned. His methods should be those of the professor of medicine as I have sketched him, and the surgical clinic should be exactly like the medical clinic with the addition of facilities for employing complicated operative procedures. The same principle should also govern the organization of the division of pediatrics or any other one of the divisions into which it is decided to separate the department of medicine.

The exact number of divisions in any department of medicine will have to depend upon the men and resources available and upon the contemporary state of knowledge concerning the various groups of diseases, and upon the immediate importance of increasing this knowledge. There seems to be no good reason, however, for dividing the department of medicine into a great number of divisions and subdivisions. Indeed, from the educational standpoint very great disadvantages are inherent in this method, owing to the scattering of interest which results. The efficiency of a department of medicine does not depend upon the number of its clinics or instructors, or upon the variety of subjects treated. The attempt to present to the student every known fact and theory concerning disease and to exhibit to him examples of every known form of disease only causes him to become confused and bewildered. What is much needed at present in medical education is the elimination of the unessential and the untrue. No student can be expected to learn all that has been thought about disease and all the theories that have been proposed. He should have, however, opportunities to learn what is actually known about important diseases and to receive the

kind of training that will enable him to discriminate between the true and the false.

A further detail of the organization of the department of medicine concerns its relation to the department of pathological anatomy. From what has been previously stated, it is obvious that the department of pathological anatomy should constitute an integral part of the department of medicine. The laboratory of pathological anatomy should be closely connected geographically, as well as in organization, with each one of the clinics. It should not be a block or a mile away from the clinics, or even in an isolated building on the hospital grounds. *It should be physically a part of the department of medicine.* There would be a great advantage in having at all times at least one assistant from each clinic acting as a member of the pathological staff. Each of these assistants should be engaged, under the direction of the professor of pathological anatomy, in studying and teaching the anatomical changes resulting from the special group of diseases which is being studied in the clinic which he represents. On the other hand, the professor of pathological anatomy should be a member of the administrative staff of the department of medicine. The effect of such an association as I have described would not only be of great educational value, but I believe that it would bring about a "new birth" of pathological anatomy.

The objection will probably be raised by some that, although the introduction of the proposed principles and plans into the department of medicine might result in a greater and more rapid accumulation of knowledge concerning disease, it would have no immediate effect upon society at large or upon the practise of medicine. If this were so, the value of the plan might be questioned, though I would not go so far as to deny its value even under these circumstances. I assume, however, that one of the most important functions of the department of medicine must be to train men in order that they may become capable practitioners of medicine. Now the practise of medicine, or the practical application of the

science of medicine, may be considered to be directed in several lines:

1. Prevention of disease or decay.
2. Diagnosis, care of the sick and alleviation of pain.
3. Cure of disease.

At the present time the first function of the practising physician is exercised in a very minor degree. The medical schools take little cognizance of it. Therefore we may omit discussion of it here, though in my opinion it is the most important of the three, and the department I have in mind would exert great effort upon the development and extension of this function.

The second important function of the practising physician is to make diagnoses, that is, to bring the particular symptoms from which a patient suffers and the most striking features of his malady into relation with a group of symptoms and signs which have already been described and given the name of a disease. This is of great importance from the standpoint both of prognosis and treatment. Originally the classification of disease was empirical; later it was founded, in part on an anatomical, in part on an etiological basis, and in part merely on the presence of some striking feature. There is much that is empirical, superficial and traditional in this subject; nevertheless, in the present state of the science, it is important. The physician, therefore, must be trained in the methods of diagnosis. He must be trained in the method of Zadig. There are many tricks, short cuts and simplified methods in diagnosis with which the practising physician should be familiar, though they have not an essential place in the fundamental science of medicine.

At present, however, the chief efforts of the department of internal medicine in our medical schools are directed towards the cultivation of diagnostic skill in the student. Much time is frequently devoted to the recognition of some rare disease, even though only a half dozen cases have ever been recognized and although nothing essential about the disease itself is known. Indeed the more unusual the special group of signs and symptoms, the more im-

portant does it seem to become. An analogy may be drawn to the state of affairs lately existing in botany when the chief attention was given to the classification and naming of plants. We now know that this is only a part, and a relatively unimportant part, of the science of botany. A man may still be a great botanist even though on walking through a field he may not be able to name correctly every plant or tree which he meets. While diagnosis in medicine is important, its position in the educational scheme is misplaced. Instead of placing it at the beginning of the study of medicine, it should come later, after a knowledge of the more fundamental principles of medical science has been acquired. If a student knows much about a few of the common, more important forms of disease, the recognition of the rare forms will be relatively easy.

Another function of the practising physician is the care of the sick and the relief of pain, mental and physical. Part of this labor is borne by the nurse, but the physician must bear the larger share, and if he is able to analyze disturbances in function, he is often-times able to bring relief even though he can not cure.

One of the chief efforts of the physician is to establish a feeling of confidence in the patient and in the family, and to relieve anxiety. The success of this effort depends largely on personality, but consciousness of real knowledge is a most important factor contributing to such an inspiring personal relationship.

In our present system the student learns less about therapeutics than about any other feature of disease. For a system of education that claims to be essentially practical, it obtains most impractical results. However much we may rail at the ineffectiveness of treatment—and the best practitioners are accustomed to do this—there are at least a few therapeutic measures that are of great effectiveness and a few diseases over which the physician has absolute control. Yet how little does the student actually learn during his student days of the really practical methods of employing these

measures! How ill prepared he is to meet actual conditions, unless the procedures to be employed are of the greatest simplicity!

By present methods, therefore, students are not well trained, even in the elements of practise, except as concerns diagnosis. They should be better trained for practise.

In order to judge of the probable effect of the proposed plan, not only on the development of the science of medicine, but on the practise of medicine as well, let us sketch briefly the proposed organization of the division of internal medicine and the nature of the work which it is intended should be carried on.

The number of clinics which compose the division of internal medicine will depend upon the funds and men available and upon the size of the university or school. Each clinic, however, should have, let us say, a hundred or a hundred and fifty beds, its own independent laboratories equipped for the prosecution of chemical, physical, physiological and bacteriological studies, as well as laboratories for pathological anatomy and facilities for animal experimentation. The number of students admitted should be limited; these students should have had a general college, scientific training, preferably with specialization in chemistry, physics or biology. Before admission to the department of medicine, they should have studied anatomy, physiology and bacteriology. This work may have been done in any university. The custom of studying one subject in one university, and another subject in another university, should be encouraged. This would result in bringing into the department methods and points of view derived from many sources.

The teachers should be carefully chosen young men who have had a good training in clinical methods and who are also well grounded in at least one of the contributing sciences, some in chemistry, some in physiology and so forth. Before appointment, they should have given evidence of ability not only to teach but also to aid in extending the boundaries of medical knowledge. In this department brief courses should be given in the methods for observing and recording the more

superficial features of disease, history-taking, physical diagnosis, X-ray examination, etc. There should also be courses in pathological anatomy, including study of the blood and other tissues that can be obtained during life, courses dealing with the application of physiological and chemical methods to the study of disease, and courses devoted to the study of the pathogenic bacteria and other parasites. As soon as possible, the students should begin the actual study of disease as it occurs in the patient, and the results as seen at autopsy. The students should spend a large part of their time in the wards and laboratories, making their study at first hand and relating all that they do to actual cases of disease. Reading must be encouraged and the student should be urged to consult original sources. It might be advisable to have the student devote a given period of his course to the study of infectious diseases, during which period much of his time would be spent in the bacteriological and pathological laboratories of the clinic. In another period the time would be spent mainly in the study of so-called diseases of metabolism, during which period he would have his working place and spend much time in the chemical laboratory of the clinic.

During his course the student should make an intensive study of at least one disease, making an attempt to learn all that is known about that disease, repeating with his own hands the important steps which have led to present knowledge, and if possible, he should add something, however slight, to existing knowledge concerning this disease. By means of seminars and conferences, both at the bedside and in the laboratory, each student would at all times be kept in touch with the work of all the other men in the clinic—students and teachers. The student would himself become an instructor of his fellow workers. The teachers would be engaged in directing and assisting the students in this work and in carrying out their own investigations.

At the end of two years the student would have acquired a great deal of knowledge about a considerable number of diseases, their prevention, nature, causes and treatment, and

would be well trained in the methods of studying disease. He would also be familiar with the methods and principles of diagnosis.

It may be true that the department of medicine I have sketched will not provide the student with the wide experience with disease in its various manifestations which would make him an able practitioner. But even with present educational methods, no one assumes that immediately after a student obtains his degree he is a capable, or even a satisfactory practitioner of medicine. It will be asked, where, under the system proposed, will the student get this wider experience and practise in technique. He will get it exactly where he gets it now, in the hospital year or years, or where he used to get it, in actual practise. No better system for producing good workmen, be they physicians or bricklayers, has been devised than the apprentice system. It is of great importance, therefore, that a good example be set in the hospitals in which students obtain experience and skill in the practical application of medical principles; this is almost as important as it is that the work in the university should be of the right kind. While the hospital can only occasionally and with difficulty make good practitioners of men who have had little or poor training in the science of medicine, it can very easily ruin men, however well they may have been fundamentally trained. There will always be the opportunity and need for good practitioners who teach by example. The preceptor system is of great value in its proper place. The trouble with the present system of medical education is that it consists almost exclusively of the old preceptor system employed in a wholesale and frequently inefficient manner. Modern developments require for medical education a scientific basis, with a final polish added by a preceptor system correctly applied.

The question will now be asked: Should the professors of medicine in the university department of medicine be trained in clinical medicine, or may they be men who have been trained only in physiological methods or chemical methods, or who have had experience with disease only as it occurs in experimental ani-

mals? In my opinion, the professor of medicine must be prepared to study the symptoms and the more superficial manifestations of disease as seen in patients, as well as to carry on complicated laboratory investigations. It is chiefly through the observations of patients that clues are obtained as to the proper direction the more complicated studies should take. It is true that much knowledge concerning disease has been obtained by bedside study alone. In the present state of the science of medicine, however, this method of study is now relatively unproductive, and unless combined with more elaborate and complicated methods is likely to result chiefly in the elaboration of theories. While theories are of importance in the study of disease, just as they are in all scientific inquiry, they are of little value, until tested by experiment.

An additional reason why professors of medicine should have a wide knowledge of disease as it occurs in man is that they will themselves have to be responsible for the care and treatment of human beings sick of disease. It is essential not only that no harm come to the patients who are the objects of study but that everything possible be done to bring every one to a state of health, or as near that as possible.

To avoid the necessity of having as teachers of the science of medicine only such men as have enjoyed a wide experience with disease in all its forms and who possess a knowledge of the craft or art of practise, two makeshifts have already been attempted. One expedient has been to have men skilled in practical medicine take over the actual care of the patients, while the real studies are made by those who have special knowledge of one of the sciences, but who have no knowledge of practise, possibly no knowledge of disease. For instance, the physiologist is invited into the clinic to make observations or studies on certain cases. In some instances this method has no doubt led to advances in knowledge. It has distinct limitations, however. Oftentimes the facts accumulated in this way have very little immediate practical significance, whereas if the observations had been made by persons properly trained in medicine, possibly only a slight

modification in the methods employed would have made the data obtained of great practical value. Combined investigation such as this has made little impression on the method of study of disease or on the men who are constantly engaged in the study or practise of medicine. Indeed it has a blighting effect on the scientific aspirations or scholarly ambitions of the men in the department of medicine. Specialists in the various branches of science can always be employed in the university department of medicine to give advice, to assist, and even to share in investigations, but the department will reach its greatest effectiveness only when the men engaged in teaching medicine and in investigating disease have not only a wide knowledge of disease as it occurs in man, but special training in one or more of the so-called contributing sciences as well.

The second expedient is to establish in connection with the medical school a department of experimental medicine, or research medicine. This is neither sound in theory nor effective in practise. It is better than nothing, but its establishment in a medical school means that the teaching of medicine will go on in the same old way, although a certain amount of reputation may accrue to the school from the fact that investigations are carried on within its walls. The employment of this makeshift has arisen from a disinclination to make any fundamental change in the old order, while recognizing that change is necessary. It arises from the recognition by those already engaged in teaching that they are not prepared to adopt new methods. These teachers do not object, however, to grafting a new department on the old one, so long as they personally retain their old prestige and perquisites. In certain schools, both in this country and in Europe, it has been proposed to divide the medical school clinics into several units, one or more of these units to retain their old character, more or less obviously, one or more to be organized into so-called full-time or university clinics, the latter term being the one which I prefer because it puts the emphasis upon the character of the work. If certain schools want to try out this method, one can not object. It is very doubt-

ful, however, whether the need for reform can be met in this manner and it seems that the reorganization of the medical teaching in such a half-hearted way is almost bound to result in failure.

It will be noted that up to the present I have not mentioned full-time or part-time employment as applied to teachers. With the conception of a department such as I have tried to present, this question settles itself. To make scientific progress requires all of the time of the most able-bodied and able-minded men that we now possess. We are not discussing a practical trade school, but a scientific university department dealing with one of the most interesting, the most important and the most complex branches of human knowledge. Could any teacher engaged in this great work want to neglect it to engage in a practical pursuit for money? If so, he has no place in this institution. If public humanitarian appeals should sometimes call him away from his hospital and laboratory, probably that would be good for him. In any case, it does not seem that we need to worry that this will interfere too much with his work, unless human nature changes.

The very important question may now be raised whether the proposed plan would not have exactly the opposite effect on the development of the science of medicine from that intended. If men in the departments of physiology and anatomy and the other contributing sciences should no longer engage in the solution of medical problems, would not the result be disastrous? It is not intended, however, that the organization of the department of medicine in the manner described would prevent men in any other department of the university from undertaking the solution of medical problems. Men in the department of physiology have been known to contribute to anatomical knowledge and the investigations in the department of anatomy are not infrequently directed toward the solution of physiological questions. It is to be hoped and expected that in the future as in the past all the departments of biological and physical and chemical science will bring contributions to

medicine. The fact that the department of medicine is itself investigating the problems of disease need have no deterring influence on these other departments; indeed this fact would undoubtedly increase the interest of the other departments in medical science. On the other hand, the university medical clinic might itself become a contributor to these other sciences. For instance, it will not infrequently happen that in order to approach its own problems, the medical clinic may first have to undertake the solution of problems which are commonly studied in the chemical laboratory or the physiological laboratory, and so on. Indeed, under certain circumstances it may be necessary to devise new bacteriological or chemical methods or new physical apparatus. Neither the student of medicine nor the student of any other branch of science should be restricted in his methods; though the student of medicine may not lose sight of the fact, that however far off his goal, his ultimate concern is with the problems of disease.

I firmly believe that if a department of medicine such as has been described were established in a first-class university, a greater advance would be made in medical teaching and in medical science and practise than was made in this country twenty-five years ago.

The one essential premise is that there exists or can be created such a thing as a science of medicine. If this is true, this science can best be fostered by giving it a place in which it can grow unhampered by the restrictions of practise. Medicine must be regarded as a real science, not an "*applied science*." The proper applications are important but in this place they should not dominate.

Let us labor to place the teaching of medicine in its true position. Let us emancipate the student, and give him time and opportunity for the cultivation of his mind, so that in his pupilage he shall not be a puppet in the hands of others, but rather a self-relying and reflecting being. Let us ever foster the general education in preference to the special training, not ignoring the latter, but seeing that it be not thrust upon a mind uncultivated or degraded. Let us strive to encourage every means of large and liberal education in the true sense of

the term, and so help to place and sustain our noble profession in the position which it ought to occupy. (William Stokes, 1861.)

RUFUS COLE

HOSPITAL OF THE ROCKEFELLER INSTITUTE,
NEW YORK CITY

RAYMOND B. EARLE¹

WE unveil this portrait of Professor Earle, the gift of his wife to Hunter College, not because those of us who were so fortunate as to know him, ever need any portrait to keep his memory living in our hearts. That beloved memory is too securely enshrined. We have no need for ourselves, to recount his successes or his charm. But for the sake of those who did not know him, memory lingers now a moment to view some of the sources and manifestations of his power.

Born in Massachusetts of an old and honorable line, his first ancestor here, Ralph Earle, came from England in that stirring seventeenth century which planted this new-world republic, and that name is still borne in the family by his brother Ralph Earle, now almost 300 years later.

In his youth our Professor Raymond Earle felt the charm of nature; began to make collections of specimens; and pressing on to College, studied geology at Harvard under the inspiration of Professor Shaler, an influence which never left him, and was always an ideal. Taking his A.B. degree at Harvard in 1900, his Sc.B., 1901 he followed with his Sc.M., 1912 and Sc.D., 1913, at New York University, after a period spent as a lawyer and economist geologist.

At New York University he taught, 1911-1913, in the department of geology under Professor J. E. Woodman. To Hunter College he came in 1913, becoming associate professor of geology, and building up what became by 1917 one of the largest of geology departments among colleges for women. He had just begun his sixth year here, in the prime of vigor

¹ Memorial address at Hunter College, New York City, by Edward S. Burgess, on the unveiling of a portrait of his associate, Professor Earle, March 1, 1920.

and only the forty-first year of his age, at the time of his sudden death of pneumonia, November 10, 1918.

He was equally at home in geology or in physical or economic geography. His research specialty had been in iron ores, with other investigations local to the Hudson. He was especially successful as a teacher in arousing and sustaining the enthusiasm of his students in his subject. He also carried over the benefits of his legal training and practise into the applications of his science. He was an extensive traveller, alone, or later with parties, conducting the latter with the purpose of giving scientific and educational views of our country, particularly in California and Alaska. He kept up his interest in a wide field of nature; his collections of birds' eggs is now at Hunter College, and many anthropological collections of Indian stone tools and weapons, pigmy bird-points of exquisite work, etc.

He was an organizer and the first director of the summer session of Hunter College, and a founder of the Physiographer's Club of New York City. He also gave public lectures here and elsewhere through the State.

A reader and forceful speaker, a skilled organizer, an intuitive discernor of human nature, Professor Earle was an unusually happy combination of the qualities which insure success. To them he added the attraction of his frank, genial, sociable, daily life at college; and at home there followed the fitting seal to his day, when in true fulfilment of his quiet but deep religious nature he gathered his little family around the evening table, and gave thanks to the Divine Giver for the blessings of the day.

RESOLUTIONS ON THE DEATH OF MEMBERS OF THE MELLON INSTITUTE

THE following resolutions have been adopted by the Robert Kennedy Duncan Club, the organization of the Industrial Fellows of the Mellon Institute of Industrial Research of the University of Pittsburgh, on the death of three members of the Institute, viz.: Dr. David Shepard Pratt (d. Jan. 28), for three